# Influence of percent intramuscular fat on individual fatty acids in the longissimus muscle from Wagyu crossbred beef

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**Abstract**

Percent intramuscular fat and individual fatty acids were measured in the longissimus muscle from the 13th rib region. The steak and muscle samples were collected 2 days postmortem and vacuum packaged from 46 animals (34 sired by Wagyu and 12 by Angus). Fatty acid methyl esters (FAME) were synthesized by $H_2SO_4$ catalysis. The fatty acids are expressed as a percent of the total fatty acids measured. Percent intramuscular fat in the longissimus ranged from 2 to 18%. There was a curvilinear and significant relationship between the percent intramuscular fat and n-3, n-6, n-6:3 ratio and polyunsaturated fatty acids (PUFA). A ten member taste panel detected flavor differences in the omega-3 fatty acid levels but not the CLA. The panel also detected significant negative flavor differences with n-6:3 ratio and PUFA. The panel did not detect significant differences for off-flavor in the n-3, CLA and PUFA levels or n-6:3 ratio. There was a positive and significant relationship between percent intramuscular fat and initial and sustained tenderness as assessed by the taste panel.

**Introduction**

Animal fat's image has suffered because of its dense caloric content contribution to the human diet. However, beef fat may impact the diet in a positive way depending on the composition of the lipids. Because beef also contributes certain monounsaturated (MUFA) and polyunsaturated (PUFA) fatty acids which may be beneficial to the human diet, there is a need to know how muscle composition affects the proportion of certain fatty acids such as omega-3 and CLA. The objective of this study was to ascertain the influence of the percent intramuscular fat in the longissimus on the fatty acid composition and taste panel response.

**Materials and methods**

Fatty acid methyl esters (FAME) were synthesized by $H_2SO_4$ catalysis and measured by capillary GC to determine fatty acid composition (O'Fallon, Busboom, Nelson, & Gaskins, 2007). A ten member trained taste panel evaluated cooked longissimus and recorded their responses to initial tenderness, juiciness, flavor, off-flavor and sustained tenderness on a 10 centimeter scale (0-10 cm).

**Results and discussion**

Percent intramuscular fat in the longissimus muscle ranged from 2 to 18%. Both panel sustained tenderness and flavor scores (Fig. 1 & 2) increased from 2 to 10% intramuscular fat in a curvilinear fashion. Omega-3, omega-6:3 ratios and PUFA (Fig. 3, 4 & 6) decreased with increasing levels of intramuscular fat. CLA (Fig.5) decreased with increasing percent intramuscular fat possibly due to the fact the animals were in a feedlot with no access to fresh green forage. Increasing levels of omega-3 and PUFA are associated with decreasing panel flavor scores. Omega-3 and PUFA (Fig.7 & 10) are negatively associated with increasing intramuscular fat. However, increasing CLA and MUFA (Fig. 8 & 9) are positively associated with increasing intramuscular fat. No off-flavor problems Fig. 11 &12) with omega-3 and CLA were detected.

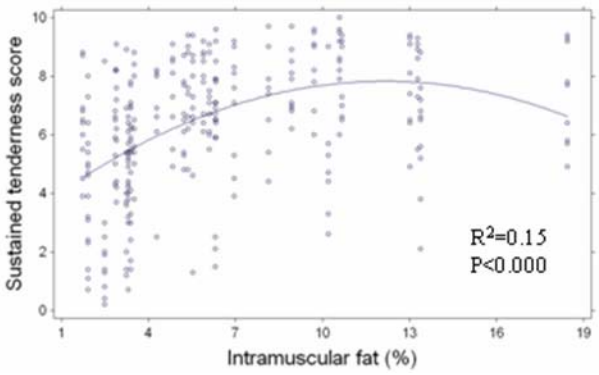


**Figure 1. Sustained tenderness associated with increasing levels of intramuscular fat in the longissimus muscle.**

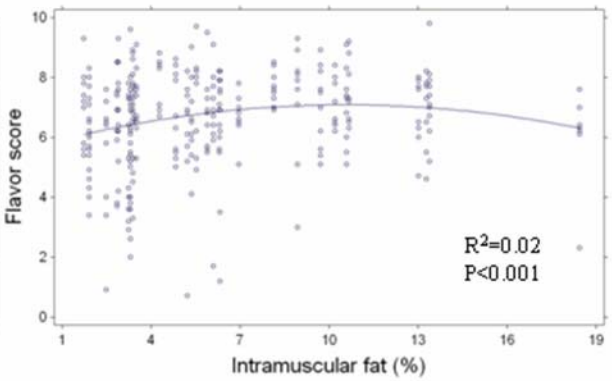


**Figure 2. Panel flavor score associated with increasing levels of intramuscular fat in the longissimus muscle.**

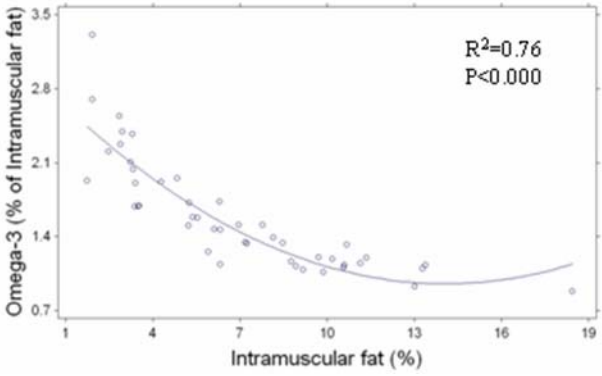


**Figure 3. Omega-3 fatty acid associated with increasing levels of intramuscular fat in the longissimus muscle.**

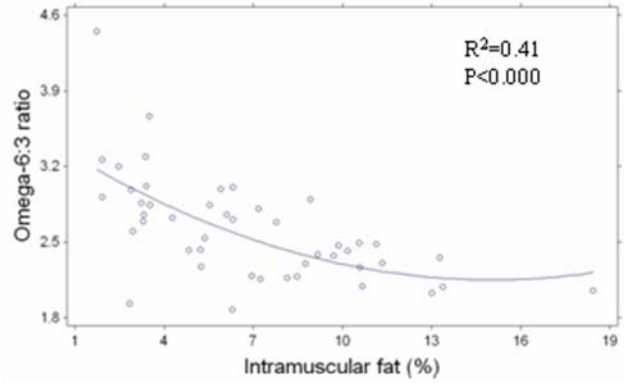


**Figure 4. Omega-6:3 fatty acid ratio associated with increasing levels of intramuscular fat in the longissimus muscle.**

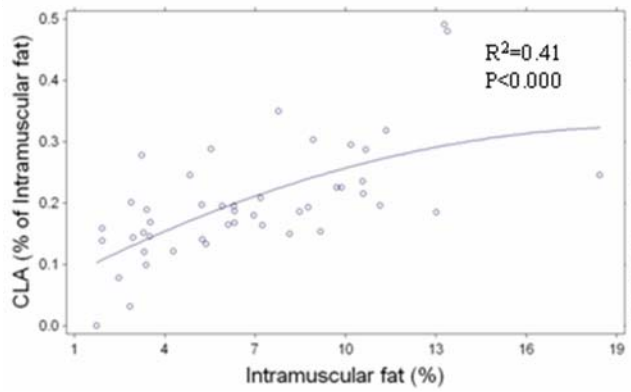


**Figure 5. CLA fatty acid associated with increasing levels of intramuscular fat in the longissimus muscle.**

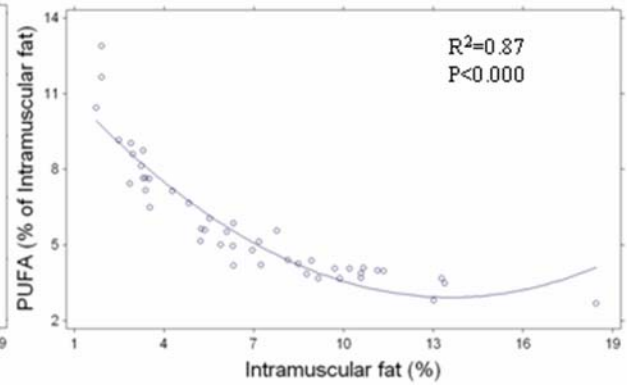


**Figure 6. PUFA associated with increasing levels of intramuscular fat in the longissimus muscle.**

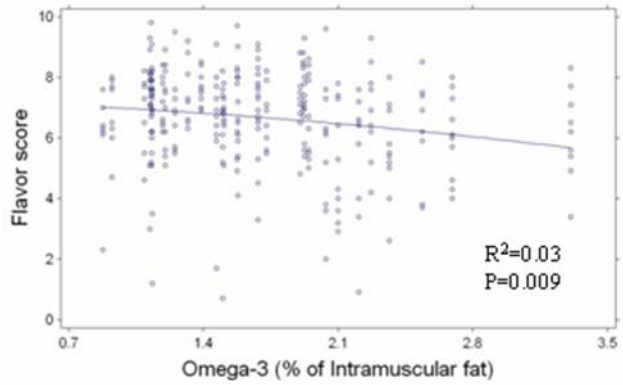


**Figure 7. Panel flavor score associated with increasing levels of omega-3 measured in the intramuscular fat in the longissimus muscle.**

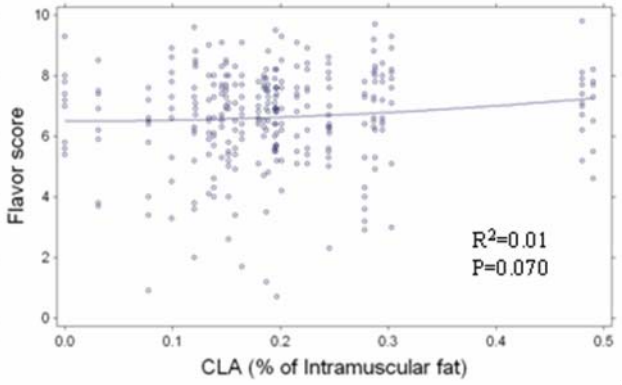


**Figure 8. Panel flavor score associated with increasing levels of CLA measured in the intramuscular fat in the longissimus muscle.**

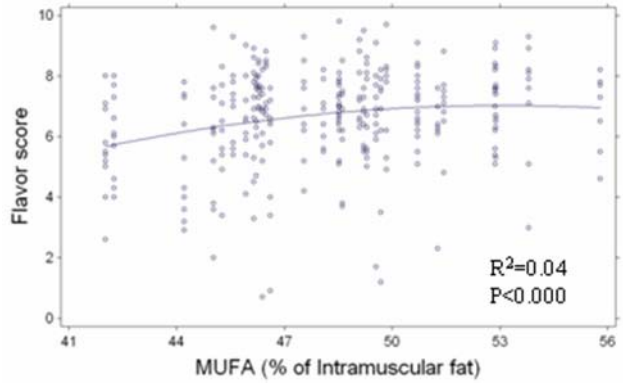


**Figure 9. Panel flavor score associated with increasing levels of MUFA measured in the intramuscular fat in the longissimus muscle.**

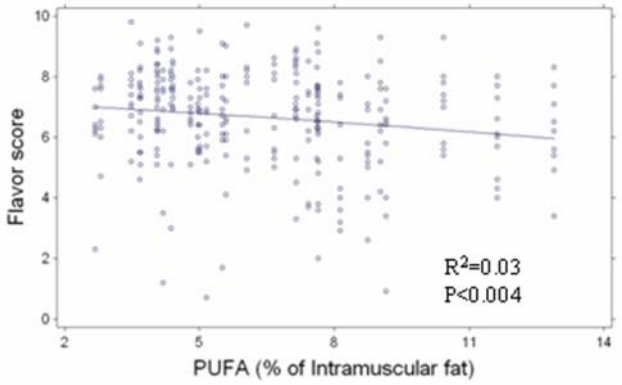


**Figure 10. Panel flavor score associated with increasing levels of PUFA measured in the intramuscular fat in the longissimus muscle.**

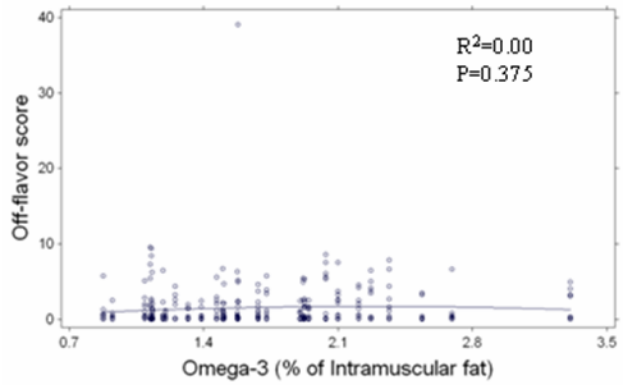


**Figure 11. Panel off-flavor score associated with increasing levels of omega-3 measured in the intramuscular fat in the longissimus muscle.**

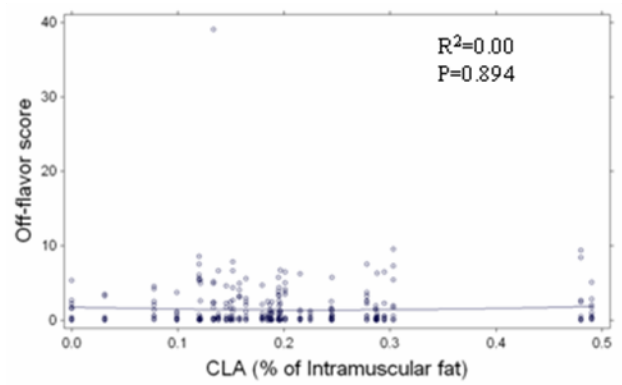


**Figure 12. Panel off-flavor score associated with increasing levels of CLA measured in the intramuscular fat in the longissimus muscle.**

**References**

O'Fallon, J. V., Busboom, J. R., Nelson, M. L., & Gaskins, C. T. (2007). A direct method for fatty acid methyl ester synthesis: Application to wet meat tissues, oils, and feedstuffs. J. of Anim. Sci. 85, 1511-1521.